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A New Species of *Petasiger* (Digenea: Echinostomiformes: Echinostomatidae) in the Brown Pelican, *Pelecanus occidentalis*, (Aves: Pelecaniformes: Pelecanidae), from the Área de Conservación Guanacaste, Costa Rica

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A NEW SPECIES OF *PETASIGER* (DIGENEA: ECHINOSTOMIFORMES: ECHINOSTOMATIDAE) IN THE BROWN PELICAN, *PELECANUS OCCIDENTALIS*, (AVES: PELECANIFORMES: PELECANIDAE), FROM THE AREA DE CONSERVACIÓN GUANACASTE, COSTA RICA

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ABSTRACT: A new species of *Petasiger* inhabits *Pelecanus occidentalis*, from the Area de Conservación Guanacaste, Costa Rica. The new species most closely resembles *Petasiger novemdecim* Lutz 1929 and *Petasiger caribbensis* Nassi, 1980 by having 19 circumoral spines and vitelline follicles confluent between the ventral sucker and gonads. The new species differs from both of these species by having a cirrus sac that is anteroposteriorly elongate and that reaches posteriorly to the midventral sucker, an ovary and Mehlis' gland that overlap the anterior testis dorsally, a uterus that lies dorsal to the ventral sucker, and a dextromedial genital pore. In *P. novemdecim* and *P. caribbensis* the cirrus sac is round and does not extend posteriorly to the anterior margin of the ventral sucker, both the ovary and Mehlis' gland are anterior to the anterior testis, the uterus runs lateral to and not dorsal to the ventral sucker, and the genital pore opens medially and sinistromedially, respectively.

Most of our knowledge of the helminth parasites of the Brown Pelican, *Pelecanus occidentalis* Linnaeus, 1766, comes from Gulf Coast populations of the United States (e.g., Leigh, 1957; Hutton and Songandares-Bernal, 1960; Courtney and Forrester, 1974; Schmidt, 1975; Dronen et al., 1999, 2003). Other Atlantic Ocean reports of parasites in the Brown Pelican include those from Puerto Rico (Bunkley-Williams and Williams, 1994; Dyer et al., 2002), Cuba (Rysavy and Macko, 1971; Macko et al., 1999), Mexico (Flores-Barroeta, 1955), and Venezuela (Diaz-Ungria, 1978, 1979). Pacific Ocean reports include those from Peru (Vasquez and Chavez Garcia, 1962; Nasir and Marval, 1968), Chile (George-Nascimento and Carvajal, 1980), and Panama (Caballero et al., 1953).

The only echinostome previously reported in Brown Pelicans is *Echinochasmus* sp. from Florida (Courtney and Forrester, 1974). Herein, we report a second echinostome that represents a previously undescribed species of *Petasiger*. Previous reports of *Petasiger* have been from in grebes, cormorants, and herons (Yamaguti, 1971; Kostadinova and Chipev, 1992; Nasicova et al., 1994). This report is a further contribution from the activities of the inventory of eukaryotic parasites of vertebrates of the Area de Conservación Guanacaste (ACG) in northwestern Costa Rica.

MATERIALS AND METHODS

Worms were collected live, then killed and fixed by shaking in hot formalin and stored in 70% ethanol. Specimens were stained with Mayer's hematoxylin, dehydrated, and mounted in Canada balsam. Host specimens were collected under the authority of CITES Permit US9258251, CITES Permit CR9123440, Costa Rica Ministero del Ambiente y Energia Licencia 203640283 and Resoluciones 215-2001-OFAU. In the following description, the first series of values stated is the range, with the mean value in parentheses. All measurements are in micrometers unless otherwise stated. All figures were made with the aid of a drawing tube.

DESCRIPTION

Petasiger combesi n. sp.

(Figs. 1–3)

Description (based on 17 ovigerous specimens): Body elongate, spinose, 1.5–1.8 mm (1.6 mm) long by 486–580 (533) wide; maximum width at level of ventral sucker. Oral sucker subterminal, 88–100 (91) long by 77–88 (83) wide, surrounded by 19 circumoral spines in single row; 8 ventrolateral spines arranged in groups of 4, all partially covered by tegument, ventrolateral spines 73–107 (89) long by 13–18 (16) wide; dorso-medial spine 85–108 (96) long by 13–18 (16) wide. Prepharynx 43–80 (64) long. Pharynx 55–77 (63) long by 40–58 (51) wide. Ratio of oral sucker width to pharyngeal width 1:0.52–0.66 (1:0.60). Esophagus 180–265 (235) long. Intestinal bifurcation 11–15% (13%) total body length (TBL) from anterior end. Forebody 38–45% (40%) TBL. Ventral sucker 300–380 (337) long by 300–350 (324) wide. Ratio of oral sucker width to ventral sucker width 1:3.3–4.2 (1:3.9). Testes tandem, immediately posterior to ventral sucker with anterior testis partially overlapping posterior margin of ventral sucker. Anterior testis 140–200 (178) long by 175–325 (271) wide, 59–66% (63%) TBL from anterior end of body. Posterior testis 165–250 (195) long by 150–295 (226) wide, overlapping posterior margin of anterior testis. Cirrus sac elongate, 300–400 (345) long by 200–275 (220) wide, posterior margin reaching midlevel of ventral sucker, containing numerous prostatic cells, telescoped pars prostatica, bipartite internal seminal vesicle, and bulbous cirrus armed with small delicate spines. Genital pore opening posterior to intestinal bifurcation, slightly dextral, close to cecum. Ovary spherical to subspherical, anterodextral and dorsal to anterior testis, with some overlap. Ovary 105–225 (131) long by 120–250 (149) wide. Ootype slightly posterior, sinistral to ovary, dorsal to anterior testis. Mehlis' gland prominent. Laurer's canal not observed. Uterus intercecal, straight, extending anteriorly from ootype region to genital pore, dorsal to ventral sucker, containing no more than 11 eggs. Metraterm prominent, muscular and glandular, 150–275 (230) long by 45–80 (67) wide. Terminal-most eggs 58–75 (70) long by 33–50 (43) wide. Vitelline follicles in 2 lateral fields overlapping ceca, extending anteriorly from genital pore to half a testis-diameter posterior to posterior testis, confluent immediately posterior to ventral sucker; follicles 33–43 long by 47–75 wide. Total extent of fields 55% of TBL, anterior extent 34–44% (36%) TBL from anterior end to 89–93% (91%) TBL from anterior end. Excretory pore dorsal, subterminal, surrounded by gland cells. Excretory vesicle Y-shaped, expanded, 150–200 (180) long by 75–125 (114) wide, bifurcating immediately at posterior margin of posterior testis slightly anterior to posterior ends of ceca.

Type host: Pelecanus occidentalis Linnaeus, 1766 (Aves: Pelecaniformes: Pelecanidae).

Prevalence, intensity, and site of infection: 1/3; 17; small intestine.

Type locality: Playa Junquillal, Sector Junquillal, 10°52.04′N, 85°38.35′W. Altitude: 321 m.

Type material: Holotype: United States National Parasite Collection, Beltsville, Maryland (USNPC) 95830. Paratypes: USNPC 95831.

Etymology: The new species is named after Professor Claude Combes, Université de Perpignan, France, in recognition of his contributions to parasite systematics and evolutionary biology.

Remarks

By having an equatorially situated ventral sucker, vitelline follicles extending anterior to the level of the ventral sucker, and a cirrus sac

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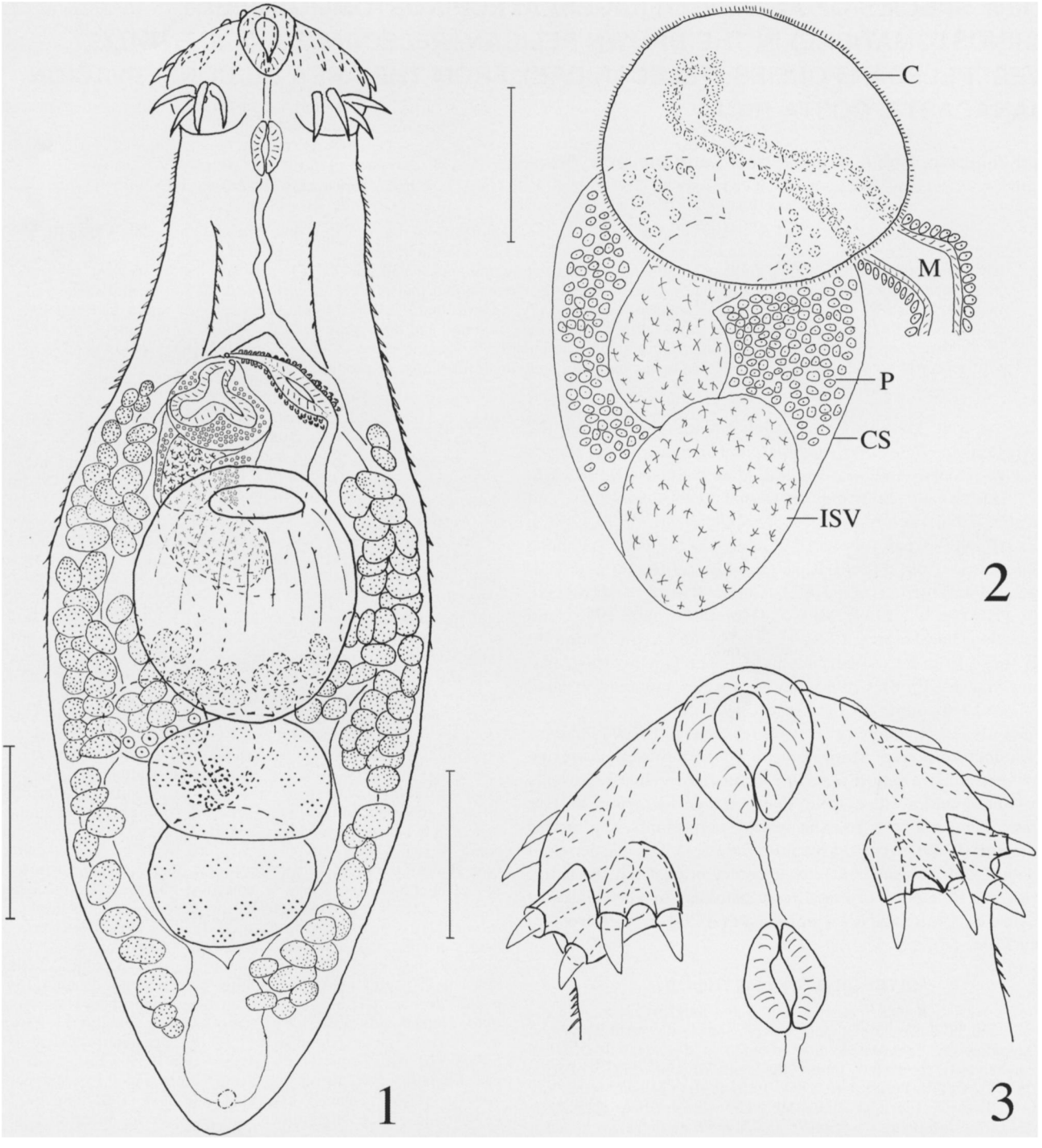

FIGURES 1–3. *Petasiger combesi* n. sp. **1.** Whole mount of holotype in ventral view. Scale bar = 250 μm. **2.** Terminal genitalia with cirrus extended in ventral view. C = cirrus; CS = cirrus sac; ISV = internal seminal vesicle; M = metraterm; P = prostatic cells. Scale bar = 100 μm. **3.** Anterior end showing tegument on cephalic spines in ventral view. Scale bar = 100 μm.

almost entirely anterior to the ventral sucker, our specimens belong to *Petasiger* Dietz, 1909. Of all the members of *Petasiger* with 19 circumoral spines, vitelline follicles confluent between the ventral sucker and the gonads, and testes in tandem, or nearly so, *P. combesi* most closely resembles *P. novemdecim* Lutz, 1928 in *Tachybaptus* (*Podiceps*) *dominicus* from Venezuela, and *P. caribbensis* Nassi, 1980, adults of which are known only from canaries infected experimentally with larval digeneans collected from infected *Biomphalaria glabrata*, from Guadeloupe, French West Indies. The neotype of *Petasiger novemdecim* (USNPC 72003) is used for comparison with our specimens. Comparison with *P. caribbensis* is based on the published account only because we have been unable to find any type or voucher material of *P. caribbensis*, and efforts to contact the author have been unsuccessful (C. Combes, pers. comm.).

The new species differs from both *P. caribbensis* and *P. novemdecim* by having a cirrus sac that extends posteriorly to the midlevel of the ventral sucker and is anteroposteriorly elongate, whereas the cirrus sac of *P. caribbensis* as well as that of *P. novemdecim* extends posteriorly

to the anterior margin of the ventral sucker and is nearly spherical. The ovary and Mehlis' gland overlap the anterior testis dorsally in the new species, whereas the ovary and Mehlis' gland are anterior to the anterior testis in both *P. caribbensis* and *P. novemdecim*. The new species can further be distinguished by having, 7–12 uterine eggs, whereas Nassi (1980) reported a maximum of 4 uterine eggs for *P. caribbensis* and Nasir et al. (1972) reported a maximum of 3 for *P. novemdecim*.

Petasiger combesi resembles *P. novemdecim* and differs from *P. caribbensis* by having tandem rather than diagonal testes. Nasir et al. (1972) reported an elongated pars prostatica and an unarmed and elongated cirrus in *P. novemdecim*. Our examination of the neotype reveals that the pars prostatica is telescoped and the cirrus is bulbous and armed with short delicate spines as in *P. combesi*, but unlike *P. caribbensis* in which the cirrus is poorly defined with papilliform microexpansions. *Petasiger caribbensis* has vitelline follicles confluent posterior to the testes, whereas they are not confluent in *P. combesi* or *P. novemdecim*. The ceca of *P. caribbensis* extend more posteriorly than those of *P. combesi*, extending to midway between posterior margin of testis and posterior end of body rather than only to the posterior margin of the posterior testis, which is also the case for *P. novemdecim*. The ventral sucker is larger than 300 in *P. combesi*, whereas it is smaller than 300 in *P. caribbensis*. Nassir et al. (1972) described the ventral sucker of *P. novemdecim* as 224–288 in diameter, but the ventral sucker of the neotype of *P. novemdecim* is 350 long by 325 wide. Finally, the genital pore of *P. combesi* is on the dextral side of the body whereas it is reportedly on the sinistral side of the body in *P. caribbensis*.

The new species further differs from *P. novemdecim* by having a dextromedial rather than medial genital pore and vitelline follicles that extend anteriorly to the level of the genital pore, rather than extending anteriorly only to between the genital pore and ventral sucker; also, all the ventrolateral circumoral spines of *P. combesi* are partially covered by tegument, as in *P. caribbensis*, whereas in *P. novemdecim* the 2 lateral-most spines are completely covered by tegument, whereas the 2 medial-most are not covered by tegument, rather, the tegument extends dorsal to them.

DISCUSSION

Petasiger has previously been reported in herons, grebes, cormorants, and other fish-eating birds (see Yamaguti, 1971; Kostadinova and Chipev, 1992; Nasincova et al., 1994) and are mainly distributed in the Palaeartic. *Petasiger combesi* is the third Neotropical species known, and the first to be reported in a pelican, *P. occidentalis*. Herons, grebes, and cormorants occur in the Area de Conservación Guanacaste, and future inventory activities may show that *Petasiger combesi* occurs in birds other than *P. occidentalis*.

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LITERATURE CITED

BUNKLEY-WILLIAMS, L., AND E. H. WILLIAMS, JR. 1994. Parasites of Puerto Rican sport fishes. Puerto Rico Department of Natural and Environmental Resources, San Juan, Puerto Rico, and Department of Marine Sciences, University of Puerto Rico, Mayagüez, Puerto Rico, 164 p.

CABALLERO, Y C., E., R. GROCOTT, AND M. ZERECERO. 1953. Helmintos de la Republica de Panama. IX. Algunos trematodea de aves marinas del Oceano Pacifico del Norte. Anales del Instituto de Biologia, Zoologia, Universidad Nacional Autonóma de México **24:** 391–414.

COURTNEY, C., AND D. FORRESTER. 1974. Helminth parasites of the brown pelican in Florida and Louisiana. Proceedings of the Helminthological Society of Washington **41:** 89–93.

DIAZ-UNGRIA, C. 1978. Helmintos de vertebrados en el Estado Zulia. Algunas especies nuevas para Venezuela. Kasmera **6:** 207–233.

———. 1979. Algunas especies de helmintos nuevas para Venezuela. Revista Ibérica de Parasitología **39:** 313–336.

DRONEN, N. O., M. R. TEHRANY, AND W. J. WARDLE. 1999. Diplostomes from the brown pelican, *Pelecanus occidentalis* (Pelecanidae), from the Galveston, Texas area, including two new species of *Bursacetabulus* gen. n. Journal of the Helminthological Society of Washington **66:** 21–24.

———, C. K. BLEND, AND C. K. ANDERSON. 2003. Endohelminths from the Brown Pelican, *Pelecanus occidentalis*, and the American White Pelican, *Pelecanus erythrorhynchus*, from Galveston Bay, Texas, U.S.A., and a checklist of pelican parasites. Comparative Parasitology **70:** 140–154.

DYER, W. G., E. H. WILLIAMS, JR., A. A. MIGNUCCI-GIANNONI, N. M. JIMENEZ-MARRERO, L. BUNKLEY-WILLIAMS, D. P. MOORE, AND D. B. PENCE. 2002. Helminth and arthropod parasites of the Brown Pelican, *Pelecanus occidentalis*, in Puerto Rico, with a compilation of all metazoan parasites reported from this host in the western hemisphere. Avian Pathology **31:** 441–448.

FLORES-BARROETA, L. 1955. Céstodos de vertebrados II. Revista Ibérica de Parasitología **15:** 115–134.

HUTTON, R. F., AND F. SOGANDARES-BERNAL. 1960. Studies on helminth parasites from the coast of Florida. II. Digenetic trematodes from shore birds of the west coast of Florida. Bulletin of Marine Science of the Gulf and Caribbean **10:** 40–54.

GEORGE-NASCIMENTO, M., AND J. CARVAJAL. 1980. Nuevos registros de nematodos anisakidos en la fauna marina Chilena. Boletín Chileno de Parasitología **35:** 15–18.

KOSTADINOVA, A., AND N. CHIPEV. 1992. Experimental data on the life-cycle of *Petasiger grandivescicularis* Ishii, 1935 (Trematoda: Echinostomatidae). Systematic Parasitology **23:** 55–65.

LEIGH, W. H. 1957. Brown and White Pelicans as hosts for schistosomes of the genus *Gigantobilharzia*. Journal of Parasitology **43:** 35–36.

MACKO, J. M., M. SPAKULOVÁ, AND J. C. CASANOVA. 1999. Morphology and taxonomy of *Stomylotrema* (Digenea: Stomylotrematidae) representatives from ciconiiform and podicipediform birds in Cuba. Folia Parasitologica **46:** 185–190.

NASICOVA, V., T. SCHOLZ, AND F. MORAVEC. 1994. Redescription of *Petasiger exaeretus* Dietz, 1909 and *P. phalacrocoracis* (Yamaguti, 1939) (Trematoda: Echinostomatidae), parasite of cormorants. Systematic Parasitology **27:** 139–147.

NASIR, P., AND F. H. MARVAL. 1968. Two avian trematodes, *Drepanocephalus olivaceus* n. sp. *Galactosomum* [sic] *puffini* Yamaguti, 1941, from Venezuela. Acta Biológica Venezuelica **6:** 71–75.

———, G. GONZALEZ, AND M. DIAZ. 1972. Freshwater larval trematodes. XXX. Life cycle of *Petasiger novemdecim* Lutz, 1928. Proceedings of the Helminthological Society of Washington, **39:** 162–168.

NASSI, H. 1980. Données experimentales sur le cycle biologique de *Petasiger caribbensis* n. sp. (Trematoda: Echinostomatidae) parasite larvaire de *Biomphalaria glabrata* en Guadeloupe. Annales de Parasitologie Humaine et Comparée **55:** 41–55.

RYSAVY, B., AND J. K. MACKO. 1971. Bird cestodes of Cuba. 1. Cestodes of the orders Podicipediformes, Pelecaniformes and Ciconiiformes. Anales del Instituto de Biologia Universidad Nacional Autónoma de México, Zoología **42:** 1–28.

SCHMIDT, G. D. 1975. *Andracantha*, a new genus of Acanthocephala (Polymorphidae) from fish-eating birds, with descriptions of three species. Journal of Parasitology **61:** 615–620.

VÁSQUEZ, D. M., AND C. CHÁVEZ GARCIA. 1962. Contribución al estudio de los parásitos de las aves guaneras *Phalacrocorax bougainvilli* Lesson (guanay) y *Pelecanus occidentalis thagus* (alacatraz). Revista de la Facultad de Medicina Veterinaria (Lima) **15:** 157–230.

YAMAGUTI, S. 1971. Synopsis of the digenetic trematodes of vertebrates. Keigaku Publishing Company, Tokyo, Japan, 1074 p.